

NAVAL POSTGRADUATE SCHOOL MONTEREY, CALIFORNIA



THESIS

**ARMING OUR NAVAL OFFICERS WITH
TOMORROW'S TECHNOLOGY ISSUING LAPTOP
COMPUTERS TO ALL NAVAL OFFICERS**

by

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September 1997

Thesis Advisor:

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**ARMING OUR NAVAL OFFICERS WITH TOMORROW'S TECHNOLOGY
ISSUING LAPTOP COMPUTERS TO ALL NAVAL OFFICERS**

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Lieutenant Commander, United States Navy

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ABSTRACT

Information superiority is the foundation for Joint Vision 2010 and the method for services to dominate the battlefield. The goal of IT21 is to rapidly implement a warfighting information network. To facilitate the engagement of information warfare, this thesis proposes that all officers be issued a laptop computer.

This thesis discusses how a computer can be as valuable as a rifle or a tank, and possibly change the way the Department of Defense fights wars. With a laptop computer, officers can have 24-hr access to critical information - turning all Naval officers into Information Warriors! When officers transfer, they will be immediately on line at their new duty station.

This thesis uses the Technical Architecture for Information Management (TAFIM) model for strategic planning and evaluates three migration paths: a paycheck computer allowance; continuing buying desktop computers within individual command budgets; and leasing laptop computers. The alternatives are evaluated using an Information Technology Assessment Worksheet. This thesis recommends that the best alternative is to lease computers for all officers and have Naval Information Systems Management Center (NISMC) be the program manager. This thesis clearly shows that after a three-year period the cost of leasing a computer is more economical than purchasing a computer.

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I. INTRODUCTION

A. THESIS STATEMENT: ALL NAVAL OFFICERS SHOULD BE ISSUED A PORTABLE COMPUTER.

“Getting all parts of a system working together requires effective communication - cooperation in exchanging information [Petersen 1997].” As we move into the 21st century, everything around us is rapidly changing. The environment, population, science, and social values seem to be changing everyday and wherever there is change, technological advances seem to be present. There has been a great deal of discussion and thought about the future of war. In fact, some people believe that the next battle will be fought manipulating information and not firing a shot. The movement is toward a more benign form of conflict resolution and if the trend continues, then large-scale conflict may revolve around manipulating information.¹

Computers have been implemented throughout the Navy. They allow personnel to work more efficiently and effectively. This thesis proposes that all officers should be issued a portable computer upon entry into the military service. It discusses how a computer can be as valuable as a rifle or a tank and possibly change the way the Department of Defense fights wars. Depending on the method of entry into the Navy and the number of officers entering per year, appropriated funds would be provided to purchase and issue portable computers for each officer. Once the computer is issued, the officer is responsible for taking

¹ Peterson, John, L., Info War The Next Generation, Proceedings, 1997, p. 62.

proper care of the computer and keeping his/her system updated with software and hardware changes issued by the service. At the end of their Naval service, or in accordance with the service contract, officers will turn in the computers.

If all officers were issued a computer, communication would significantly improve. Frequently, an officer transfers to his/her next job and there is not a computer immediately available. If one is available, the equipment is out dated and slow, or it is running unfamiliar programs. It would be convenient to report to your new duty station, carrying your own laptop computer with all of your old files, and all you have to do is plug it in and it works. The officer could be immediately on line with virtually no delays.

B. ASSUMPTIONS AND SCOPE

This thesis evaluates the proposal of issuing computers to all Naval officers. It provides information on the cost to purchase large quantities of desktop computers, the cost to lease laptop computers, and the cost to purchase large quantities of laptop computers.

Computers have automated many activities that were conducted manually, saving both time and money. For the purpose of this thesis, it is assumed that issuing a laptop computer has the possibility of making an officer more proficient and therefore, efficient. The general idea is that an officer will have 24-hour access to a computer, thus giving him/her the ability to communicate or be informed at all times. This thesis will also discuss the benefits of all officers being issued a laptop computer.

C. QUESTIONS TO BE ANSWERED

When introducing any new idea or system, there are questions that must be answered prior to implementation. For the idea to be successful, personnel need to feel that the idea is an improvement in the process. It must be evident that the benefits outweigh the costs.

1. How much would it cost to issue computers to every officer?

The Navy spends a significant amount of money each year on information technology (IT) and information technology systems. Many commands are beginning to breakdown IT costs into various categories to look at improving processes. Would the proposal offered in this thesis fit into the Navy's IT budget? Are there IT dollars to buy all officers a computer?

2. Is it more cost effective to lease or buy computers?

Now that computers have become relatively inexpensive, compared to their cost 10 to 20 years ago, more and more commands buy computers for all personnel. Some people consider the computer a consumable. Most officers will arrive at a command and there will be a computer at his/her desktop, already connected to a local area network. The computer might be outdated, meaning slower speed, not the latest hardware, or not the greatest storage capacity available. If the computers were just going to be used for word processing, then there would not be any need for the Officer to have the newest desktop computer or a portable computer. With a lease agreement, the Navy would pay a certain amount per month for a certain number of years. Purchasing computers for all officers would be a lump sum payment. Which is cheaper?

3. Is it more economical to have the Navy purchase computers in bulk for all officers or have individual commands purchase the computers?

Currently, if an officer needs a computer at his/her duty station, the command that he/she is attached to is responsible for providing that computer. Depending on the command's size and requirement for computers, there may be any number of computers a year, from one to one hundred. The more they buy from an individual company, the better the opportunity to get a discount for large quantities. If the Navy was leasing or buying 56,000 computers (one for every officer) it is likely that a volume discount would be available, resulting in significant IT dollar savings. What kind of quantity discounts are available?

4. If leasing is the best option, how will the lease work? - Or if buying in bulk is the best option, how will it work?

This thesis will evaluate three alternatives in order to select the best method obtaining computers for all officers. The first alternative is to lease computers for all officers. Some commands, such as, USCINLANTFLT, are trying the leasing option now [Brewin 97a]. How will leasing 56,000 computers work? The second alternative is to offer officers a computer allowance. Under this concept, every payday the officers would get money in the form of an allowance, which is intended to go toward the purchase of hardware and software. Could that be the best option to ensure officers have computers that are compatible and inter-operable? The third alternative is to continue having individual commands purchase computers as needed for officers. Is this the

most efficient and effective method? All alternatives will be compared and evaluated using an information technology worksheet.

5. Does every officer really need a computer?

Currently, when an officer reports to his new command, there may or may not be a computer available for full time use. Pilots (and others in similar job requirement positions) spend a majority of their time in the aircraft. At what point, if any, do they need a computer? Should the Navy look at job requirements and issue computers accordingly? And- if so, who is going to determine this?

6. What type of computer do officers need and do all officers need the same type of computer and should they use specific software?

If officers have different job assignments and different responsibilities, should they not use computers with capabilities that uniquely fit their job assignments? An officer that uses a computer for word processing might not need Pentium speed. What programs should be running on these issued computers? Should officers be able to put whatever software they want on their computers? If software is restricted, what software should be loaded?

7. Who should manage the lease or purchase agreement and the computer policy and how will it be implemented?

Some Naval command would need to develop and negotiate a contract if the computers were leased or bought. Whoever manages the contract would need to have the ability to communicate with all officers to provide software and hardware information. The command managing this program would need to publish instructions and restrictions. Which command is most suitable to do this?

8. What happens if a young Ensign reporting aboard his first ship accidentally drops his laptop over the brow? What if he drops it down a ladder and the computer is damaged?

There must be a process in place to facilitate the repair of broken computers or replace lost computers. Should a Navy command conduct all maintenance or could there be a maintenance agreement included in the contract agreement? Repair or replacement speed would have to be fast so that access to a computer would not be lost.

D. CHAPTERS TO FOLLOW

Chapter II will describe where the services, in particular the Navy, are heading and what the plan is for getting to the year 2010. The Army, Air Force, and Navy are all focusing on a world of Information Technology and how each can position itself to use information most efficiently. There are different angles for the services to approach and gain access to information. One idea that is common among the services and other countries is a joint or coalition approach to solving world conflicts. It may have been easier in the past to focus forces and understand (know) the threat. No longer is the Soviet Union the primary threat. Instead, an overall defense strategy must include plans for attacks from smaller countries that may be able to employ advanced technologies. The aggressor may not necessarily be the country with the biggest weapon, but the one with the smartest computers. Included will be what each of the services is focusing on and how or if services are working together. Advances in technology have

promoted access to the Information Superhighway. The Army, Air Force, and Navy must leverage this technology in order to maintain dominance and superiority.

Chapter III will thoroughly explain the thesis idea and how it could affect military operations. The concept promoting a paperless message system, where Naval messages would be on-line and available on the local area network, however that system is not operational. With officers being issued a portable computer, the idea of a paperless world would be one step closer. Officers can communicate using electronic mail (EMAIL), when the telephone is not convenient. Also, all reports and other documents (forms) could be maintained on the computer and forwarded electronically. The idea that all officers would benefit from a portable computer is a difficult to measure. How can one predict how much value the computer will have in regards to communication? Each officer might have different uses for the computer and without implementation, it is difficult to measure efficiency and effectiveness. This thesis will discuss how the computer can make the officer more informed if he had full-time access to a portable computer.

Chapter IV will include cost information and a description of implementation using Technical Architecture for Information Management (TAFIM). This chapter will assess contract options for obtaining the large number of computers for all officers. It will also examine the feasibility of including computer maintenance, repairs, and upgrades within the lease or purchase contract. This chapter will also include an analysis of each step in the TAFIM model to show the flow and

movement of the portable computers. Migration paths will be evaluated by using an information technology assessment worksheet.

Chapter V will summarize the findings from the thesis, re-address each of the thesis questions, and provide recommendations for future research.

II. WHERE THE SERVICES ARE HEADING

Computers were designed and put into use to reduce the manual efforts and allow for more efficient work. Today computers are prevalent in everyday activities around the world. As technology advances at rapid rates, sophisticated computers are used in more challenging applications and in many situations eliminated human interaction. For example, in the medical field, artificial intelligent machines diagnose diseases in minutes that used to take years of education for a doctor. It used to be only a nice thought to report to a new duty assignment and have a computer that was on your desktop and connected to a Local Area Network. Now, when you report to a ship or shore station, if the newest equipment has not yet been installed, the command usually has a plan to upgrade and implement improved systems. The officer now has a workstation and is capable of quickly completing routine assignments. The Internet and World Wide Web have become a valuable source of information. Computers today have numerous uses including administrative uses, general communication, message traffic, weapons targeting, and combat systems. Computers are used to calculate and maintain inventories, including total asset visibility so that smaller inventories can be maintained.

A. JOINT VISION 2010

The focus of the Department of Defense is to have the various Department of Defense agencies of the United States forces work jointly and with other nations to fight world conflicts. The scope included in the notion of protection of U.S.

national interests includes the engagement of actual ground battles to providing assistance during and after national disasters.

The vision for the future, as discussed in Joint Vision 2010, is to develop four operational concepts as listed below:

Dominant maneuver,

Precision engagement,

Full dimensional protection,

Focused logistics.

Each service has a unique capability, but success is with the forces working in a “joint”, common operating environment with a common strategy. Each service has proposed its vision for the 21st century, and many of their ideas are shared. They all agree that our forces must be well trained and well informed. The services are relying on advanced technology in the form of computers with artificial intelligence, to wage an effective national defense with fewer personnel. From a joint vision, the military’s goals are to protect the lives and vital interests of Americans both at home and abroad, and to promote democracy. Other nations tend to view the United States as the peacekeeper. With the fall of the Soviet Union, there is no longer a battle between only two super powers, instead it is more of a focus on maintaining the United States’ dominance as a world super-power. America’s interests must be protected. “The primary task of the Armed Forces will remain to deter conflict - but, should deterrence fail, to fight and win our nation’s wars.” [JV2010-96] Many foreign allies have come to expect U.S. involvement in solving world conflicts and providing aid in disasters.

Our forces must be able to work efficiently with our allies in many operations. The joint vision includes U.S. forces working together in general, conventional warfighting activities. Our forces will fight if necessary to resolve a conflict, and joint fighting is now considered to be the key to success. Coalition forces with multinational components will face aggressors. The U.S. will continue to show a presence overseas, while still protecting it's own borders. A nuclear deterrent will be maintained to show power projection and U.S. forces overseas displays a presence and concern for allies. The other key to U.S. success in world peace is the ability to rapidly mobilize forces. When working jointly and with other nations, procedures must be precise and interpreted correctly. Forces must practice for real-life situations and crises.

The foundation of Joint Vision 2010 is centered on quality forces. Elite leaders must train the people, and they must have quality weapons and equipment to operate. The services have focused on recruiting methods to select quality personnel and stressed effective leadership development. Assuming that the forces have quality personnel, they also need capable equipment. As advances in technology rapidly occur, our equipment must continually be maintained and consistent with current technology. We cannot afford to use anything but the best, within budget. Equipment must aid the soldier in providing superior mission performance. Testing and improvements in equipment design continue to ensure the best-outfitted soldier. Soldiers continually practice in real life exercises using newly developed equipment to ensure that only the most proficient equipment is produced.

As written in Joint Vision 2010, the world is rapidly changing and it is not enough to just have U. S. services working jointly. Forces must be multinational. It is difficult to be precise about the next conflict because there is a wider range of threats. Multinational forces need to be prepared to participate in variety of conflicts. Forces must work smartly; using the best technology and reducing cost wherever possible. Americans are relying on U.S. forces to achieve success, win any battle, and basically solve world problems in their interests. It may be difficult to predict what the opposing force will use for a strike. As U.S. forces shrink and platforms are reduced, the military needs to use stealth and mobility to make up for those reductions. Relying on stealth and rapid mobility means that movements must be synchronized.

As the world is riding on the information highway, the military must have information superiority. Information warfare and information operations have become a popular and well-known terms. Just as the U.S. forces have the ability to use advanced technology to gather information about their adversaries, opposing forces are fine tuning these same technologies to compete as a super power. U.S. has to be able to get the right information to the right people at the right time. At the same time, we must prevent opposing forces that same opportunity. Collecting information will assist in locating troop movements and possibly prevent a ground war. Rapid dissemination of valuable information can significantly improve the timelines of attack warnings. Improved information in terms of quality and timeliness translates to improved decision making in terms of quality and timelines. In the next chapter, the idea to issue all officers portable

computers will be linked to information warfare/information operations, as a basic starting point. All officers should know where to find pertinent information and how to use it!

B. U.S. ARMY (FORCE XXI)

As written in Joint Vision 2010, future threats are difficult to visualize. National military strategy may change, and the shape of United States forces may change, but the role of the Army has not changed. The Army needs to have trained personnel who will win on the battlefield, wherever that battlefield may be. The Army is responsible for bringing the soldiers and all necessary equipment to face any threat. The Army is expected to project power when necessary and win all battles. To be prepared to face any battle in the 21st century, the Army developed a plan for a strong, forceful Army and the plan is called Force XXI. Force XXI is the Army's modernization plan. This modernization may not change the goals of the Army, but it certainly changes how the Army will achieve those goals. While currently maintaining peace, the Army is also looking towards the future, predicting what it will need to win future battles.

The Army is planning to have a digitized battlefield. The Army's goal is to build a completely digitized battlefield where the commander on the battlefield has digitized battle space information and that a commander can communicate with anyone outside of that space. Army leaders will need to be information technology masters. The Army views that success in future battles will depend on the ability to gather and manipulate information. The Army vision is

“America’s Army, trained and read, a strategic force serving the nation at home and abroad, capable of decisive victory...into the 21st century [Force21–97].”

Force XXI is the Army’s thrust into the 21st century. General Gordon R. Sullivan said that the Army is trying to read everything it can about the 21st century and then trying to create those same situations for simulated exercises. Force XXI calls for three complementary efforts:

Reengineering of the Operational Army,

Redesigning the Institutional Army,

Acquiring information-age technologies.

For re-engineering operational forces around information, the Army is analyzing how it fights, organizes, and commands. The Army is reviewing doctrine, tactics, and techniques to ensure that soldiers are prepared to act in an information-saturated environment. The Army must be organized to win with fewer soldiers and the Army’s commanders must be the elite. To support the re-engineering effort, the design of the institutionalized Army must facilitate the creation maintenance, and structure of the force. The key to re-engineering and redesigning is to move towards a seamless information architecture. The Army is focusing on:

- How to establish an architecture to develop and field information-related technology rapidly,

- How to streamline acquisition of information-related technology to better integrate the collective efforts of both the Army and industry.

The Army has developed a future training strategy called War Fighter XXI (WFXXI.) As Force XXI develops from simulated exercises, the Army gets a good idea of the type of soldier needed for 21st century battles. The Army's new training plan is being changed as necessary based directly on results of Force XXI. Training is the Army's number one mission in peacetime. WFXXI mission is:

- Publish a plan for the total Army to meet this strategy;
- Ensure leader development and the three training pillars (self-development, institutional, and unit) are incorporated in the strategy;
- Use training aids, devices, simulators and simulation to enhance/supplement live training;
- Integrate the live, virtual, and constructive environments into a seamless training battlefield;
- Automate training.

One of the assumptions used in building WFXXI is "though not all technologies are known, future technologies and capabilities must be exploited for use by all. We must manage the continual ongoing change of the information age to achieve the best training for the force." Despite the fact that the size of the Army has decreased, the Army will continue to be involved in major regional conflicts, peacekeeping, and humanitarian missions. To be successful in future battles the Army is preparing a training strategy by using simulated exercises. The success of those exercises and future battles relies on advanced technology to rapidly process information. [Force21-97]

In summary, the Army is training forces using new technology. The Army is preparing for the future war where information and "jointness" are the keys to success.

C. U. S. AIR FORCE (GLOBAL ENGAGEMENT)

In summarizing the key points of the Honorable Sheila E. Widnall's, Secretary of the Air Force, remarks to the National Security Forum, she said that to prepare for the 21st century we must first describe the "New World Order." She said that the control over the fuel of today's revolution, information, is difficult.

The Air Force and other services must be involved and engaged in global activity, and American citizens need to understand the importance of U.S. involvement. The Secretary of the Air Force stated that U.S. involvement in world conflicts allows the U.S. to shape the outcome.

All the services agree that U.S. security objectives have remained constant - to secure the lives and property of our citizens. It is just that the method of force used to protect our interests has changed and will change in the future. The Air Force, to prepare for the 21st century, has titled their vision for the future, "Global Engagement." The Air Force role in U.S. military operations is air and space dominance. "We are now transitioning from an air force into an air and space force an evolutionary path to a space and air force." Some key U.S. military functions such as surveillance, reconnaissance, weapons guidance, and

communications are moving into space. The U.S. must control space and be prepared to protect U.S. space interests against adversaries.

The U.S. Air Force vision statement is, “Air Force people building the World’s most respected air and space force...global power and reach for America”. The Air Force has divided their plan for the 21st century into five areas as shown below:

- Central Themes,
- Core Competencies,
- Capabilities,
- People,
- Organizational infrastructure.

The central themes of the Air Force revolve around the integration of air and space. As the Air Force continues to reduce in size, it must be committed to innovation. The Air Force will rely on battle laboratories to develop and explore new ideas to improve capabilities with reduced manning and possibly reduced assets. Battle laboratories will be committed to space, air expeditionary forces, battle management, force protection, information warfare, and unmanned aerial vehicles. Research and development, and a commitment to innovation are the keys to the Air Force future success.

The pressure to reduce expenditure calls for the Air Force to change the way they do business. The vision for the Air Force includes support functions manned by civilians and operated more like a business. “Our war fighting activities will be designed for effectiveness and our support activities will be

designed for efficiency.” In addition the Air Force will be analyzing and evaluating new information technologies and the acquisition methods. The Air Force plans to explore the idea of joint centers. Where research and development for U.S. forces can be combined for efficiency. More and more the Air Force, as well as the other services, will look at outsourcing and privatization. [USAF-GE-96]

Similar to the Army, the Air Force has set goals for the future, which includes well-trained personnel and the use of technology.

D. U. S. NAVY (IT21)

As with the Army and the Air Force, the Navy must do more with less. The Navy has developed a plan to move swiftly into the 21st century and it is called Information Technology in the 21st Century or IT21. The Navy started its plan by looking at the communications architecture. In IT21, the Navy defines standards such as the operating system, platform, and protocol. In a message released by Admiral Clemins, CINCPACFLT, computer standards are specifically defined. The Navy determined the bandwidth must be increased for full communication and the way to increase bandwidth is by using satellites to the greatest extent possible. The Navy wants to use the worldwide web everywhere and is analyzing how that can be accomplished by the year 2010. According to the Navy’s plan, the seven habits of a highly effective information technology system are:

- If the Boss does not use it, do not buy it;

- Tactical and Non-tactical must be integrated;
- Stay common with Industry;
- Drive everything to a single PC;
- Use commercial-off-the-shelf where feasible;
- Transition from sea/shore is seamless;
- Buy icons, not hardware.

As discussed throughout the Navy's plan, everything must be seamlessly integrated. The key to IT21 is information management. The idea is to put information into the computer and retrieve knowledge in real-time. IT21 is a fleet driven "re-prioritization of [Command, control, communications, computers and intelligence] existing programs of record to accelerate the transition to a PC-based tactical/tactical-support warfighting network [CINCPACFLT 1997]".

In 1990, the Navy published Copernicus, an initiative to make command, control, communications, computers, and intelligence (C4I) systems responsive to the warfighters. It is realized that there must be a systematic way to gather and use information. The Navy recognizes that good information is the key to successfully engaging future wars. The Navy must be able to conduct Information Warfare on shore and at sea. "We can only gain an advantage over our opponents if we are the first to implement offensive information tactics into our warfighting arsenal [Boorda 95]." The Navy's plan discusses how information is a factor in warfare. This notion has caused Naval forces to redefine the way we fight wars.

In the next chapter, the primary concept that “all officers should be issued a portable computer” will be introduced. The chapter will explain how issuing the computers will help facilitate and support the Navy’s IT21 plan.

III. THESIS IDEA

As technology continues to advance at a rapid pace, the services are trying to change and keep pace with these advances. The Navy plans to use technology to the greatest possible extent. IT21 provides information about “going modular”, so that as technology advances, we can build upon our current systems instead of just eliminating old systems and using the new. We have found that systems become outdated too quickly and it is difficult to modify existing systems. One of the ideas stressed in Joint Vision 2010 and all of the services 21st century visions, is that forces must use technology to be the best. Admiral Clemins has mentioned in his speeches that he would like to see shipboard officers with a desktop computer and at least one computer for every five enlisted personnel at sea. This thesis proposes that all Naval officers should have a laptop computer.

A. ISSUE PORTABLE COMPUTERS

Whether one is using a laptop or a desktop computer, machines can be used for a variety of tasks. For example, if everyone had a computer, the Chief of Naval Operations could send an EMAIL or an important message to all officers or sailors and be confident that the message would be received.

An important question to ask about this thesis idea is why should the officers be issued a computer and what would they use it for? Officers use computers in their everyday business. Laptop computers have an advantage over desktop models because they allow for mobile communications and 24-hour access.

Issuing all officers a personal laptop computer has the possibility to improve many of the officer's daily activities. The officers have the opportunity to gain proficiency, make more informed decisions, and improve overall efficiency.

1. General Communication

The computer is an excellent source for general conversation especially when communicating across countries and different time zones. With advances in technology, communications from ships has significantly improved. Soon satellite communications will be perfected, where there is enough bandwidth for a large number of users, and EMAIL messages can reach everyone from any location. With a portable computer and an Internet connection, an officer can have 24-hour access to EMAIL. With a laptop computer, the officer has the flexibility to use the computer without actually sitting at his/her work site. The portable computer facilitates mobile communication.

2. Access to Databases

The Navy has discussed databases being moved to shore stations to consolidate and provide "one stop" access. The idea is to move databases off the ships and maintain them on shore. Databases can be easily accessed and updated from the ship. Forms can be put on a database and accessed from the ship or anywhere. Personnel Support Activity functions and officer's Fitness Reports, as well as various reports, could be done electronically. With the portable computer the officer has flexible access to databases. An example of how personnel records could be accessed with a personal computer is the Air Forces' current "personnel page". [USAF-AFPC] With access to the Internet,

Air Force officers can log onto this personnel page and view jobs available by rank and location. Officers can also volunteer for their next assignment on the Internet. They can view their personal data and in fact, view the records of the personnel that work for them. Instead of having a stack of personnel records for their enlisted troops, officers can click onto the Internet, from home or the office, to view records.

3. Publications

The flow of ideas could be circulated more efficiently if publications were on-line. It is difficult to put all thoughts, projects, and Navy events into publications and ensure personnel are able to read the information. For the most part, Navy news is printed in magazines and some in message traffic. Not everyone has access to the various naval publications available in circulation. All publications and articles dealing with the Navy or other services can be placed on line and easily accessed by Officers. Officers can be better informed of what is happening in the Navy and around the world, and be able to pass on accurate information to junior personnel. Currently, headlines that are relevant to the DOD are available on the internet through "Early Bird." Also, the Navy Times is now on-line. Officers could view this material quickly and frequently from work or home. Other publications, including instructions and regulations, are available through web pages. Instead of walking over to the administrative officer or personnel office to look up an instruction, it could easily be accessed from the officer's desktop.

4. Information

Messages and Operation Orders are going to be sent electronically or be available on a secure web page, so even the most junior officer will have a viable means to view the battle plan. Officers can be more informed and can pass knowledge (accurate knowledge) to junior personnel. The world has entered the information age and as discussed in the Chief of Naval Operations message to all commands, there is an information explosion because the Internet and World Wide Web are easy to use [CNO 95]. Issuing officers their own laptop computer gives them an opportunity to become a warrior within the network-based warfare. With a portable computer, every Officer becomes an Information Warrior!

5. Standardization

Exactly what type of computers and software do the officers need? Admiral Clemins advised the Navy that any future computers would have certain features. This thesis is suggesting issuing the officers laptop computers so that they can take it with them to the next command. This thesis assumes that all officers need a computer for daily information and communication. The average officer may not be able to afford to continually buy upgraded computers and maintain his/her "own" computer. The laptops purchased for all officers would be interoperable. Ensuring all computers can operate the same standard software attains interoperability. The computers may not be exactly the same, however, over the Internet, the computers would appear to be the same because the officers would be running the same software. As technology advances, new computers would be issued to officers. Buying or leasing computers in bulk

quantities for all officers corresponds to Admiral Clemins set standards. If the Navy takes the lead on this and as the idea for all Officers to be issued computers spreads, the other services could participate, and all systems and computers would be made interoperable. As our force strength shrinks, the idea is "joint". The services must work together on missions for complete U.S. protection. Not only is it U.S. joint, but U.S. forces must also work with coalition forces as well. With common software, officers can communicate across services.

6. Training

Technology and new software updates would require training. Computer based training (CBT) would be conducted on the Internet and the training could reach anyone in the fleet. New course material could be downloaded. When new hardware or software is introduced, step-by-step training would be available on the officer's laptop computer. The officer can complete the training at within his/her schedule.

7. Mobility

The main idea of this thesis is that issuing laptop computers to all naval officers allows the officer flexibility to work at home, in the office, or in the field and it allows for mobile communications. The laptop can be taken on travel, to meetings, or to his/her house. The officer has the flexibility of always having a computer at his/her location. The laptop could be carried to conferences and the officer has 24-hour access to information.

B. IMPLEMENTATION

Who would manage a contract that affects all Naval officers? Today, individual commands manage their own contracts. Larger commands have the opportunity to save more money by buying in bulk quantities and upgrading in large quantities. How about the smaller commands with fewer computers and a small budget for upgrades and maintenance? To issue computers to all officers, one command would have to manage the contract for the computers and ensure that standards are in place and the contract is working smoothly. An argument against purchasing computers for all officers would be the cost. Where will the money come from? The Navy purchases numerous computers every year only to have technology advance with an upgraded computer within 18 months. The solution would be to lease the computers. In fact, that is what is currently happening. The Navy is negotiating lease agreements that should be available by 1 October 1997, to lease computers, routers, and complete systems. The Navy could get a reasonable lease deal with a particular company and when technology or software upgrades become available, the computers would be turned in for the upgraded model. The officers would be notified that upgrades are available. With a lease, the program manager would have more flexibility and spend less money.

Some commands are moving toward leasing because they are finding savings in hardware costs. The lease would contain a number of standards and run for some defined period of time. Companies are submitting bids for leasing computers and entire systems to the government. The first contract might be for

a short period, for example three to five years. At that point, an analysis of the cost and benefits could be conducted, and if the benefits do not outweigh the costs then no other contracts could be let. The contract would include frequent software and hardware updates, or, as Dorothy Hennigan, director of C4 resources management for the Atlantic Fleet, said that the Navy (commands) already own the software and the software is transferable.

The civilian world has been leasing for some time now. The government is beginning to see that the same benefits can work for them too, especially while budgets are constrained. The Navy is looking at saving money on hardware and in maintenance costs. With a lease agreement, there is also the opportunity to significantly save on upgrade costs.

1. Stop desktop purchases for officers

Commands would no longer have to worry about purchasing computers for their Officer complement. The Officer will report carrying a laptop computer with all the latest, standardized software installed. That Officer will know how to send/receive EMAIL, access data bases which contain a variety of information including all forms, pay records, and personnel records, and the Officer will be able to review message traffic. The officer will arrive at his/her new command with files maintained from their previous command. This will possibly allow them to be settled quicker in that they will no longer have to recreate new files. An Officer should be able report to his/her new command, plug in the portable computer and have access to the Internet, all data bases, and EMAIL - instantly part of the new network-based military structure.

Computers, which are already available for officers on shore duty, would be used until obsolete, which occurs in less than 3 or 4 years or the excess computers would be redistributed. It can save the Navy money by buying or leasing in bulk, instead of buying a small number of computers per command. This idea is examined in Chapter IV by analyzing various migration paths using the TAFIM model.

These savings in upgrade costs would work for the laptop lease for all Naval officers. As technology advances and the company with the contract acquires a better computer, the officer is notified. The existing computer is turned in for a new one. It should not matter whether the officer is reporting for shore duty or to sea duty. The value of every officer being issued a computer would have to be realized and then budgeted accordingly.

2. Loss/Damage to the laptop computer

If an officer drops his/her computer and the computer is beyond repair, what happens? We currently have a survey program that would solve the “overboard” problem. The computer loss would be summarized and investigated, and if necessary reported on a DD Form 200 (Report of Survey). There are a couple solutions for the repair problem and one is to give officers a monthly or annual computer allowance similar to a uniform allowance. The allowance can be used to have the computer repaired, cleaned, or parts replaced. The other idea is to have a separate Navy command manage the repair of broken computers. This thesis compares alternatives and offers the best solution, which is described in the next chapter.

IV. TAFIM AND IMPLEMENTATION

With technology advancing quickly and possibly changing the way wars are fought, there needs to be a strategic management policy that can be followed when implementing new systems. The Technical Architecture for Information Management (TAFIM) model, shown in Figure 4.1, provides excellent guidance when implementing new information systems.

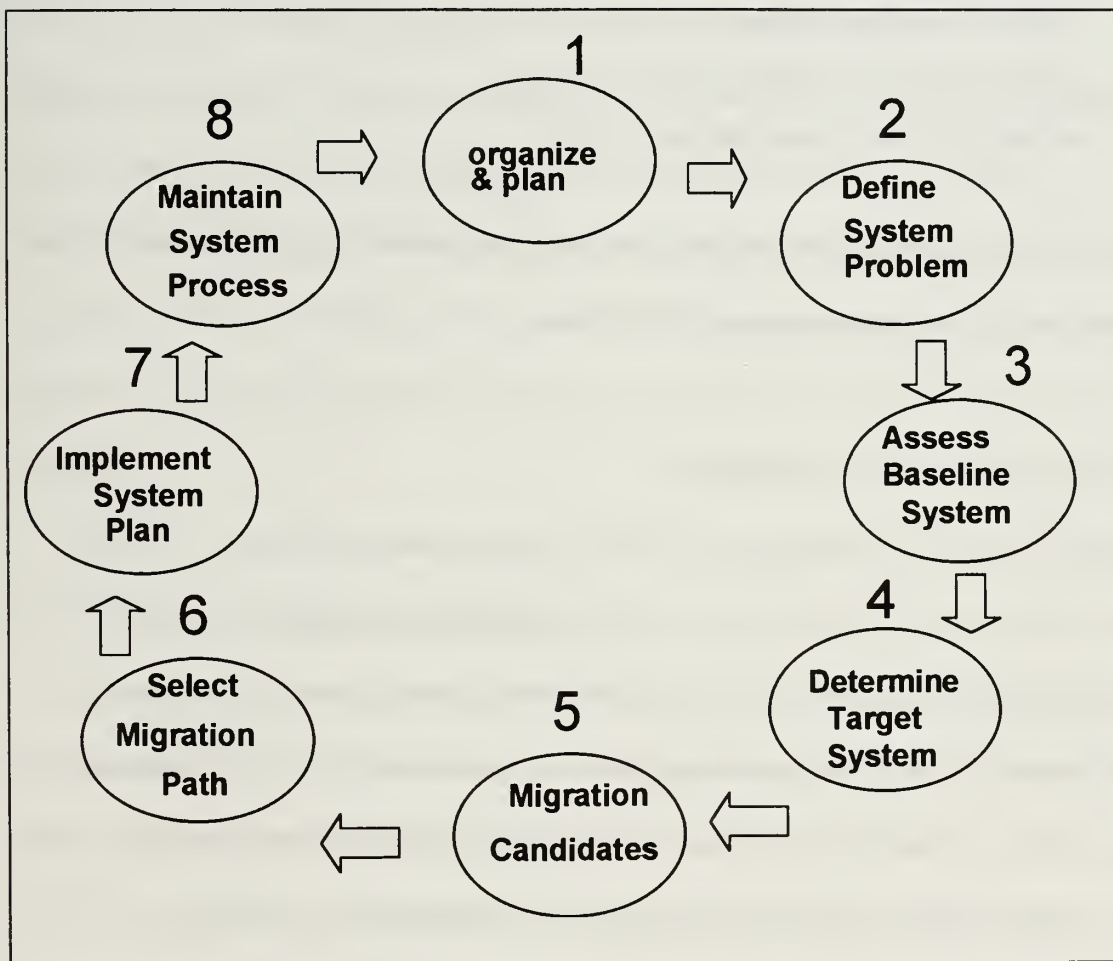


Figure 4.1 The Structure Approach Process

Below are the eight essential and sequential steps to TAFIM:

- Organizing and Planning
- Defining the System Problem
- Assessing the Baseline System
- Determining the Target System
- Developing Migration Candidates
- Selecting the Best Migration Path
- Implementing the System Migration Plan
- Maintaining the System Migration Plan

The TAFIM model is used to show how to implement the proposal that all Naval officers should be issued a portable computer.

A. ORGANIZING AND PLANNING

Step one in the TAFIM model is called **organization and plans**. The main idea of this step is to establish some initial guidance and state the vision. Admiral Clemins, CINCPACFLT, states that all officers onboard ships should have computers and that there should be one computer for every five enlisted personnel, provides a vision for the Navy. Navy personnel need computers and need advanced technology to conduct their daily jobs better and faster, especially with a shrinking military force. As discussed in the previous chapter, computers facilitate successful training, communication, and information flow. Military forces are now looking at a possible revolution in military affairs borne by relatively affordable technology. This technology provides the capability to get

more information, faster. As force size decreases and technology continues to advance, the services are focusing on reengineering processes to take advantage of this technology. One such area is the contracting/acquisition arena. As evidenced by the Information Technology Management Reform Act of 1996, the position of the Chief Information Officer, and the Federal Acquisition Reform Act of 1996, DOD is changing the way technology is acquired and used. The focus is to consider buying new, advanced technology wherever and whenever possible. However, the use of that advanced technology must be well planned and proved to be in support of the command's mission. Another planning consideration is that when considering adding advanced technology to buy modular and commercial off-the-shelf (COTS) products only. This facilitates advances in technology, allowing hardware to be added, as upgrades become available.

B. DEFINING THE SYSTEM PROBLEM

The next step is to define the system problem. If the requirement is for a new advanced technological system, then something must be wrong with the current system. The problem is one that is being addressed by all services and that is that there is not much commonality and compatibility between systems used within each service. Naval officers transfer to different commands every two to three years. The officer is required to adjust and learn different systems. He/She has to start over, not only learning a new job, but also learning the next command's computer systems. In addition, the officer must catch up on

whatever was missed during the transfer and leave process. Issuing officers a laptop computer resolves part of the problem by providing the officer some continuity. There, however, must be computer infrastructure for that officer to plug his/her computer into to make this work.

C. ASSESSING THE BASELINE SYSTEM

The third step of the TAFIM is to determine the character and state of the current system. Again, the Navy and all the services are analyzing what systems are in place that can be valuable in the future with technology advancing at such a rapid pace. Currently, commands buy computers for their individual commands. Based on the command's budget and an evaluation of need, computers are purchased. Given that a legitimate need for computers exists, the number of computers purchased and how often computers are purchased depends on the availability of funding. Some commands may not have adequate funds to keep pace with changing technology. Computer systems that are in place may be adequate, but not the best. With the Navy looking at building modular systems, issuing computers to all Naval officers would allow them to plug into the global grid from any command anywhere in the world.

D. DETERMINING THE TARGET SYSTEM

The next step applies to the system architecture. How will issuing a computer to all Naval officers fit into a future system. As technology advances and the opportunity for mobile computing is developed, issuing portable computers to all

officers is required. The computer would be similar to other minor property issued to officers, for example, a calculator or a cellular telephone. The ideal architecture is for all systems to be compatible. Joint Technical Architecture and Defense Information Infrastructure Common Operating Environment provides guidelines for the infrastructure. The future would also include officers being able to use his/her computer from the home or in the office. The future "system" would already have to be in place for worldwide communications. Currently an officer, if issued a portable computer, could pay for America Online or a similar Internet service, and use the computer to do work at home. The officer could then carry that same computer to the office. The Navy should also consider providing a similar service via AOL, or dial in service at each base or ship.

E. DEVELOPING MIGRATION CANDIDATES

Step 5 includes developing different paths to the perfect solution. There will be alternative paths because technology changes, budgets, and time-phased requirements are not known with certainty. With the Navy's vision of ensuring every officer has a computer, what is the best method of obtaining computers?

1. Migration Path #1 (Officer Allowance Option)

To make the purchase and issue of computers economically feasible, one idea is to give all Naval officers an allowance. Similar to the uniform allowance given to enlisted personnel, the officers would be given money in their paycheck every month to cover the cost of the laptop computer. The allowance can be given twice a month for a period of one year. For example, if all Naval officers

were given \$59 as a computer allowance each paycheck for one year, then the officer can purchase a reasonably priced laptop computer. This additional allowance can be for one year, or possibly spread over a three-year period. The officers should be able to buy a new laptop computer every three years. Similar to other allowances, it may be difficult to monitor how the additional allowance is used. With 56,000 officers, it may be tough to verify how each officer spent their allowance. The allowance is for purchasing a new laptop computer and the officers will be responsible for proper use of the allowance. The other possible problem is that officers may not all buy the same laptop computer. It would be easy for the Navy to publish specific guidance and rules on what the officer can and cannot buy. IT21 specifically states requirements for hardware and software. The Navy can create an instruction stating the rules for this computer allowance. The officer would be required to have the same computer equipment to ensure compatibility. Table 4.1 shows the costs to the Navy for a \$59.00 allowance costs in 56,000 Naval officers paychecks.

Periodicity	Dollar amount (per officer)	Total
Paycheck	\$59.00	\$3,304,000
Monthly	\$118.00	\$6,608,000
Annually	\$1,416	\$79,296,000
3-years	\$4,248	\$237,888,000

Table 4.1 Allowance Costs

Looking at Table 4.1, \$237 million dollars is a significant amount of money over a 3-year period. The idea is to spread the cost of a lap top computer over a 3-year

period. Technology has allowed computer speed to almost double every 18 months. The officer would then have an allowance to upgrade his/her computer every three years. Figure 4.2 displays different allowances for one officer.

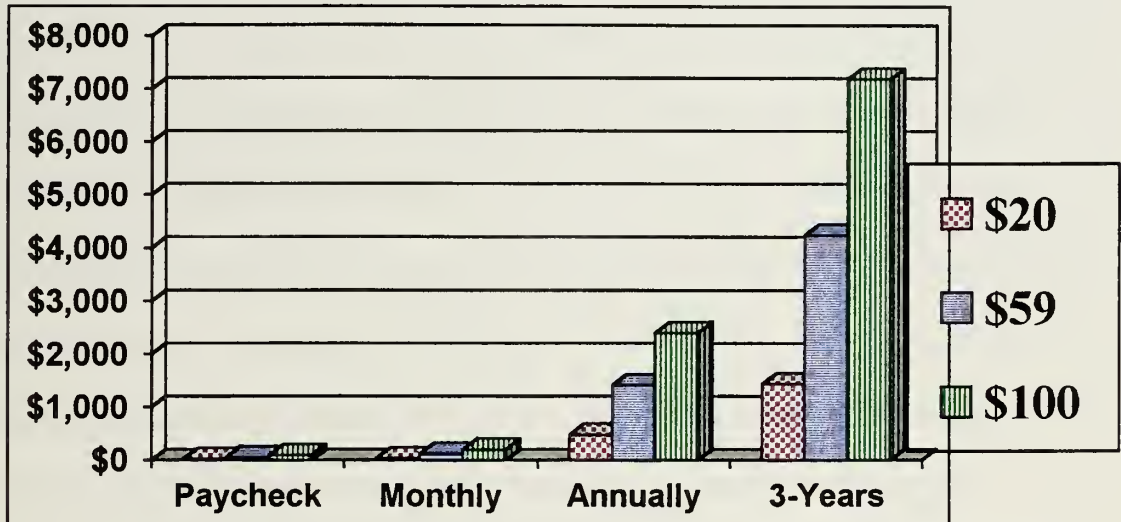
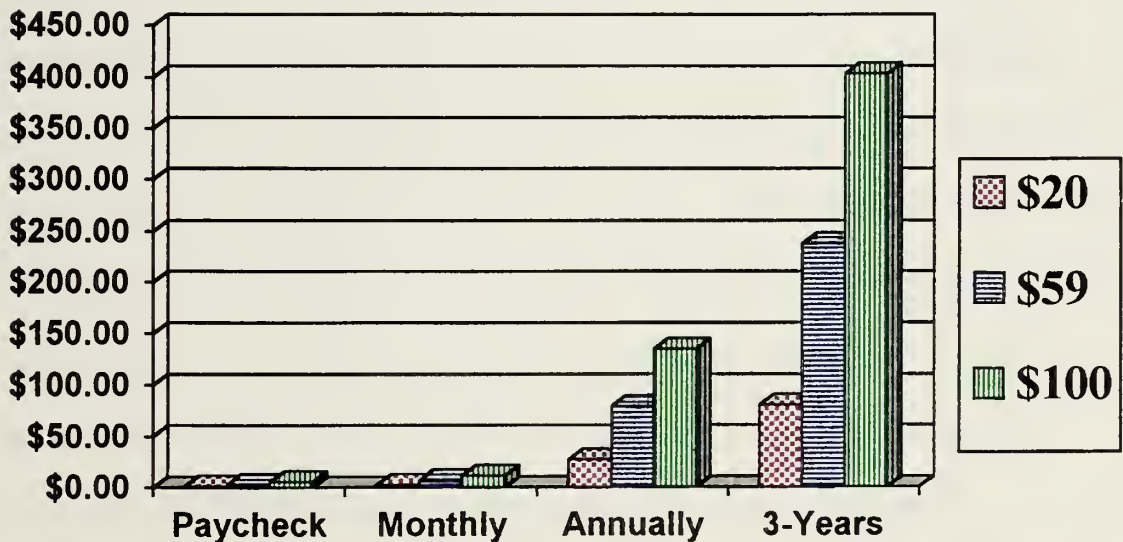


Figure 4.2 Various Allowances Per Officer



Millions

Figure 4.3 Allowances for 56,000 Officers

Figure 4.3 shows the cost of providing an allowance to 56,000 officers at different allowance values. With a monthly allowance, the officer has the flexibility to purchase the laptop on his/her own time. The Navy could have agreements with local companies to purchase the computers in bulk quantities to supply the officers in the area. Officers would then be told to go to a particular store in their area to purchase the computer. Buying the computers in bulk would possibly save money on the computer and required software. One problem that arises, with the allowance method of ensuring officers have portable computers, is the issue of computer repair and maintenance. What happens when the officer is having problems with the laptop computer? Some maintenance problems will be under warranty, but there could be problems that are not covered under warranty. A solution for that problem would be that the command that the officer is attached to will do maintenance. This may increase the need and number of technical personnel required at the responsible command. The officer's command would be responsible for periodic maintenance not covered in the warranty. If somehow the officer damaged the computer beyond repair, due to his/her negligence, then they would be solely responsible for replacement of the computer. Although, the computer would be "the officer's", commands would be responsible for conducting "check-ups" to make sure officers have a computer and report the results to the program manager. The officer would have the flexibility to use the computer at home, at the office, or on any travel.

Commands would not be required to provide a desktop computer for officers. Depending on the number of officers at each command, it could save the

command IT dollars. It would appear to be a significant savings for the commands, however, there is likely to be a decrease in the authorization to provide allowance money.

Table 4.2 shows dollars not spent on desktop computers for officers per command, depending on the number of officers.

	Per Officer	Per 10 Officers	Per 50 Officers	Per 100 Officers
BUY	*\$4,288	\$42,880	**\$192,960	***\$343,040

Table 4.2 Command Budget decreases

*Price from USSOCOM market research

**Purchase price discounted 10% for larger quantity

***Purchase price discounted 20% for larger quantity

For 56,000 Officers

Purchase Computers	\$240,128,000
\$20 Allowance (3 years)	\$80,640,000
\$59 Allowance (3 years)	\$237,888,000
\$100 Allowance (3 years)	\$403,200,000

Table 4.3 Allowance vs. Purchase for all officers

Table 4.3 shows the purchase cost for purchasing all officers a computer versus the allowance. Commands would no longer be responsible for purchasing

officer's computers. Officers would be responsible for purchasing their own computers within Navy standards. The computers would belong to the officer.

2. Migration Path #2 (Current Method)

The second migration path would be to continue providing computers to officers by command. Currently, commands purchase desktop computers as needed within their budget. The computers are purchased and the property of the command (the Navy). Technology is advancing so quickly that computers are outdated between 18 months and 3 years. USSOCOM analyzed desktop computers and technical advances. They came up with a three-year technical life cycle for desktop computers. USSOCOM determined that the computers are under a three year warranty which is equal to two technical-life-cycles.

The "S" curve developed by SOCOM shown on the next page in Figure 4.4 shows how the value of the new computer to the user begins to decline after 36-months. [Galinger 97] SOCOM determined from monitoring personnel use of upgraded equipment, that the average user does not use the new equipment 100% until after 24-months. Once the user becomes proficient, advances in technology allows for improved equipment.

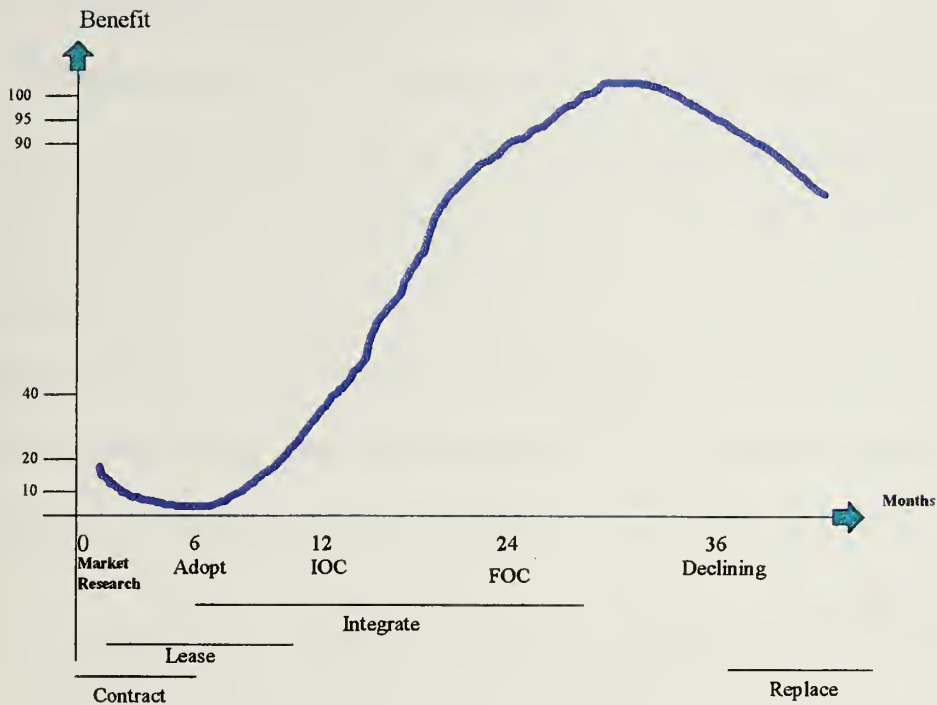


Figure 4.4 Life Cycle

The curve shows that when a command purchases a new networked computer for a system, there is a point of diminishing returns. It takes a while to insert the computer into the network. At the end of the third year of the life of the new computer, the technology demand will exceed the capabilities of the compute. Additional costs are also incurred at the end of the three-year period. The warranty for that purchased computer expires and the command is then responsible for the cost of maintaining that computer. Also, once that computer is outdated and no longer of any value to the command, the computer is disposed of - turned into DRMO or given to a school (whatever policy the command has). Essentially, the computer has no turn in value.

3. Migration Path #3 (Lease option)

Migration path #3 is to lease and issue laptop computers to all Naval officers. Currently, CINCLANTFLT has a contract request to lease various computer equipment. The command is receiving bids in August 1997. The request is in accordance and in support of IT21. CINCLANTFLT is using their statement of work to get the best lease agreement for all their computing needs vice using an already established Government Services Administration (GSA) contract. The highlights of the contractual request are [CINCLANTFLT 97]:

- This is a straight lease agreement that will enable the Government to periodically require a Technical Refreshment of the leased equipment, based on the Schedule of Technical Refreshment contained in the clause entitled "TEHCNICAL REFRESHMENT". The lease contained in the contract shall be for a base period of 12 months, with four twelve-month option periods. The total period of the lease shall not exceed five years. At the end of the contract period, the leased equipment will be removed from service to a central point at the Government site. The Contractor shall then prepare, package, and ship the equipment back to the Contractor's facilities. This lease agreement shall include maintenance of all items for the entire length of the contract.

- The Government has the option to renew the contract at the expiration of the initial contract term and any renewal terms until all options are exercised. The Government shall have the right to terminate any or all leases stated herein subsequent to issuing 30 days written notice to the contractor. The termination of any one or more of the types of equipment listed in Schedule B (command's list of requested items) will not change the conditions of this contract nor the monthly unit lease price. The Government shall have unlimited use of equipment provided under the lease. No extra use charges shall apply. No re-pricing of equipment shall be allowed due to the termination of the contract for the convenience of the Government, or upon non-renewal of options or upon reduction in the amount of equipment leased by the Navy.

- Periodically the Government will require technical refreshment of the leased equipment, pursuant to the change clause. Note: Technical Refreshment of Software is not a requirement under this contract. The Government shall provide to the Contractor written

notice 90 days prior to the date for any required changes due to the need for technical refreshment. The anticipated schedule for technical refreshments of equipment are contained in the clause entitled "TECHNICAL REFRESHMENT".

- Equipment replaced due to Technical Refreshment shall be returned to the Contractor, no later than 30 days after receipt of replacement equipment. Government personnel shall package the replaced equipment in the packaging from the replacement equipment, and ship to the Contractor, at Government expense.

- Installation of the equipment is not a requirement of this contract. Installation of equipment shall be the responsibility of the Government.

- Equipment delivered under this contract shall meet the specifications for the equipment as contained herein. Only new equipment shall be provided by the Contractor under this contract. Refurbished equipment shall not be used.

- Commercially available equipment are required. To qualify as "commercial equipment," the equipment must meet the definition for "Commercial Items" as contained in FAR Part 2.

- All equipment must be state-of-the-art technology and in current production at the time this proposal is submitted, as well as at the time of Technical Refreshment. State-of-the-art equipment is defined as the most recently designed equipment which is in current production, marketed, available, maintained and supported in accordance with the mandatory requirements specified elsewhere in this document. Prototype or developmental equipment is not acceptable.

- The Contractor shall provide maintenance coverage for all equipment. Maintenance coverage shall commence upon the first day of the contract. Any equipment returned to the Contractor for repair shall be returned to the Government, no later than 15 days after the equipment is removed from service. The Contractor shall return the equipment as either a repaired or a replacement equipment that is the manufacturer's equivalent replacement part. The repaired/replacement equipment shall be returned to the Spares Pool no later than 15 days after the equipment was removed from service for repair/replacement.

- The Contractor shall maintain a Spares Pool consisting of no less than 10% of the total quantities required for each item. The Spares Pool shall be provided by the Contractor at no additional lease price to the Government. The Government shall provide an on-site storage space for the Spares Pool.

- All Magnetic Media (Hard Disk Drives) shall become the property of the Government, and will not be returned.

- At the end of the Contract, the Contractor shall prepare the equipment for shipping, package the equipment, and arrange shipment of the equipment back to the Contractor's facility at Contractor expense. All equipment shall be removed by the Contractor from the Government's facility no later than 14 days after the end of the contract.

- Base Security and Clearances - Upon award of contract, Contractor shall submit to CINCLANTFLT, a letter requesting a site clearance for all maintenance personnel.

- Maintenance Charges - There shall be no additional contractor maintenance charges, in addition to the monthly lease price.

- Maintenance Services - The Contractor shall provide those maintenance services required to keep all equipment, including all parts and labor, in good operational condition; and subject to security regulations, the Government shall provide contractor access to the equipment to perform maintenance service.

- On-Call Maintenance Service - The contractor shall provide on-call maintenance service during the Principal Period of Maintenance, which shall be 0700 through 1700 local times, Monday through Friday, except Federal holidays.

- Software Compatibility - All Hardware delivered under this requirement shall be capable of running Windows NT, MS Office 97 Professional, IBM Anti-virus, MS Back Office Client, MS Outlook 97, MS Exchange 5.0, and MS Image Composes.

CINCLANTFLT has security concerns and, as shown above, have included

purchasing hard drives in the contract request. At the end of the lease agreement, the computers and equipment has to be returned in good working condition, but CINCLANTFLT cannot just hand over their hard drives because secure information may be on the hard drives. The hard drives would have to be degaussed and then they would be of no use to the contractor. By purchasing the hard drives instead of leasing them with the other equipment, the Navy can maintain desired security. Buying advanced commercial items is also part of the above contract request. The Navy included the importance of buying Commercial-Off-the-Shelf (COTS) products and CINCLANTFLT has stressed the use of commercial products in their contractual request. The contract request for

numerous computers and other system requirements, including desktop computers, servers, printers, laptop computers, and docking stations.

In CINCLANTFLT's contract request, maintenance request times were specified to ensure prompt responses from the contractor. As stated in the contract agreement, all maintenance personnel must have a security clearance, which enhances the security. The request states that maintenance personnel should respond within four hours of the initial call for assistance. The user would have a single telephone number to call for 24-hour assistance. The telephone line will be manned by a contract person or an answering machine.

Mr. Bill Gormley, assistant commissioner for acquisition at FSS was quoted as saying, "Leasing seems to be the next wave in the private sector. If you look at the total cost (from) the time of acquisition to disposal, leasing is now proven in the private sector to be cheaper, even with laptops [Bass 96]."

CINCLANTFLT is hoping that leasing computers and system equipment will prove to be cheaper. Bids for the above summarized contract are due in August 1997 and the Navy plans to have a contract active in October 1997. Instead of paying large amounts on purchasing computer equipment, the yearly costs are smaller. Commands do not end up with a bunch of outdated equipment that has no turn-in value. The savings incurred through a lease agreement can offset the cost of equipment upgrades. Instead of having an equipment upgrade plan for purchased equipment, the lease agreement would include automatic upgrades. Commands would no longer have to purchase new equipment because upgrades would be included in the lease agreement.

The United States Southern Operation Command (USSOCOM) did a study on leasing desktop computers in an attempt to save the command information technology dollars and at the same time keep up with advances in technology. The command conducted market research on the cost to lease, rent, or purchase desktop computers. Table 4.4 displays the results of USSOCOM's analysis [Galinge 96].

<u>Method</u>	<u>Price</u>	<u>Time</u>	<u>Total</u>
<i>Purchase</i>	\$4,288.00	N/A	\$4,288.00
<i>Rent</i>	\$425.00	36 months	\$15,300.00
<i>Annual lease 3yr</i>	\$1,429.20	36 months	\$4,287.60

Table 4.4 Lease cost information

By viewing the chart, it appears that the lease and purchase prices are equal. USSOCOM considers the lease the best option for flexibility and the other intangible benefits that are not available when purchasing the computers. The command likes the idea that they are not making one large investment that will be of no value after three years due to the rapid advances in technology. Instead, the payments are spread, in monthly increments, over a three-year period. The other valuable tangible benefits are that the contractor manages inventory and is responsible for maintaining adequate inventory. USSOCOM plans to have the contractor responsible for the installation, which they consider another benefit. They do not have to have the technical personnel to install or

maintain the equipment. In addition, the command saves by not having to worry about maintenance, including preventative maintenance.

When the lease expires or it is time for upgrades, the computers are turned over to the contractor. USSOCOM has no responsibilities. At turn in time, the contractor then gets all the computers back and has the opportunity to sell those computers. USSOCOM can end the lease at any time, in accordance with the lease agreement. The contractor does not want the lease to end short of the agreement time. The contractor wants the lease to run full term so that the company can have money to pay off the original computer purchase. This pressure on the contractor provides a positive incentive towards good customer service. The company will provide the best possible service because they do not want the lease agreement to stop. By the time the lease expires, the money/loan that the contractor took out to purchase the computers is paid off. The contractor realizes his profit when he finally receives the used computers and sells them.

General Services Administration (GSA) is fueling the government's desire to lease computers and computer services. GSA calls it "Seat Management". In 1996, GSA began allowing contractors to offer computer equipment for use only without buying or owning the equipment. GSA's contract agreements are similar to the ones discussed above, in that, the contractor will be responsible for providing hardware, software, asset management, connectivity, maintenance, design, and installation. GSA plans to award a contract by 1 March 1998 and the contract will run eight to ten years with three-year tasking orders.

The goals of Seat Management are [Bass 97]:

- Keep abreast of the latest technology;
- Obtain consolidated support services;
- Reduce the need for in-house expertise;
- Reduce the cost of IT ownership;
- Establish a common operating environment;
- Match tools and software to mission requirements.

GSA believes that this is the way businesses, including the government, need to acquire computers and computer systems. The following are highlighted terms and conditions included in GSA's proposed contract agreements [DOD 96]:

- Logistics: Delivery

The leasing company shall purchase the Equipment specified in the Government's Order for delivery to the "ship-to" address specified on the Order

- at the end of the Lease Term, or earlier Fiscal Year end due to unavailability of funds, the equipment shall be in its original condition less any ordinary wear and tear, and the Government shall have no responsibility for any loss or damage to the Equipment during the Lease Term occasioned by the negligence of the Contractor in performing any service/maintenance on the equipment.

- To determine the Lease Term rate, the Contractor agrees to apply the following indexed rates to the difference between the Equipment's price under a corresponding GSA Schedule Contract and the agreed upon residual value of the Equipment(s).

- Purchase Options: #1 If a decision to purchase Equipment is made at the end of the Lease Term, the purchase option price will be determined by the fair market value of the Equipment which shall be substantiated by open market quotes for the same or similar Equipment(s) from three independent appraisers. Under no circumstances shall this price exceed 23% of the original equipment price for a 24 month lease or 19% of the original equipment price for a 36 month lease. #2 In the event the Government desires, at any time, to purchase Equipment leased hereunder, the Government may make a one-time lump sum

payment. The lump sum payment shall consist of the value of the remaining payments under the Lease, plus the original residual value, plus all costs including the financial and administrative costs and profit of the Contractor for the residual value during the Lease Term.

- The Government may affix or install any accessory, addition, upgrade, equipment or device on the Equipment ("Additions"), provided that such Additions:

(1) can be removed without causing material damage to the Equipment

(2) do not reduce the value of the Equipment

(3) are obtained from or approved (in writing) by the Contractor and are not subject to the interest of any third party other than the Contractor.

In summary, migration path #3 is a lease agreement for approximately three years. The Navy would have a contract agreement with a company to lease 56,000 laptop computers. The lease agreement would include maintenance and upgrades. At the end of the lease, the government will turn-in their computers (if upgrades are not available) or the lease will be renewed. The Navy does not own the computers, but the computers must be returned with only normal wear and tear, as specified in the contract. Officers would be issued the computers and would use the machines until told to turn them in for upgrades or lease cancellation. The officers will transfer with the computers and the freedom to use the computers at home or in the office.

F. SELECTING THE BEST MIGRATION PATH

The sixth step of TAFIM is to evaluate each of the migration paths and select the best path. The paths are evaluated using criteria relevant to the mission. One of the best tools to analyze re-engineering and re-invention is

TurboBPR [SRAC 96]. The government realized that too much time was spent on process reengineering and consequently, a team was formed to streamline the process. TurboBPR consolidates about 140 of the already existing re-engineering tools. The software is easy to use and allows managers to easily identify goals and performance measures. TurboBPR consists of five modules.

The first module is planning. In this module, the activity enters the mission and vision for the command. This has become an important step due to reduced funding. The reengineering plan must link back to the strategy of the command and support the mission. In addition, in this module performance measures are entered. The idea in the planning module is to develop ideas to improve the business process. Most commands have similar goals, to reduce the cost of a process and serve customers better.

The second module is operations analysis. This is where the costs of the current process method are entered. Then the forecasted-process costs are entered for the process improvement idea.

The third module of the software is initiatives. In this module, initiatives are created and linked to strategies. Once the initiatives are created, the impact of these initiatives on operation costs and performance are measured. The strategies are what the command wants to do to decrease costs or improve performance and initiatives are how to implement those strategies.

The fourth module consists of alternatives. Alternatives are measured against a baseline. An alternative is a set of initiatives measured as a single package. In this module, managers can see a complete view of the financial and operational

impacts of the alternatives. In this module the command can analyze the economic value and compare the performance of alternatives.

In the fifth module, actual cost and performance measures are compared to the projected figures. After comparing actuals with predictions, results can be show graphically. [SRAC 96]

TurboBPR is an excellent software tool, which allows commands to trim process-improvement costs. Naval commands usually do not maintain detailed records of how much was spent specifically on personal computers for Naval officers. In fact, all officers do not necessarily have a government personal computer. The idea in this thesis is to issue computers to all officers. Therefore, this thesis uses an IT investment assessment worksheet to evaluate alternatives relating to issuing computers rather than TurboBPR.

1. Evaluating Migration Paths

The IT Investment Assessment Worksheet uses a scoring guide to evaluate each of the alternatives. The scoring guide is shown on the next page.

IT Investment Assessment Scoring Guide

VALUE

- 1. Return on Investment (ROI) – Risk-adjusted, discounted, organization-wide**
 - 0 Negative ROI over next 5 years
 - 1 0-50% over next 5 years
 - 2 51-100% over next 5 years
 - 3 101-300% over next 5 years
 - 4 301-600% over next 5 years
 - 5 Over 600% over next 5 years
- 2. Strategic Match – Extent to which it contributes to achieving one or more strategic goals.**
 - 0 Makes no contribution to achieving a strategic goal
 - 1 Contributes indirectly to at least one strategic goal
 - 2 Modestly contributes directly to at least one strategic goal
 - 3 Significantly contributes directly to at least one strategic goal
 - 4 Significantly contributes directly to more than one strategic goal
 - 5 Contributes in a major way directly to one or more strategic goals
- 3. Competitive Advantage – Extent to which it provides a unique advantage with customers or otherwise makes the organization perform better than competitors in the quality, timeliness, and accuracy of product or service deliveries, in communications with customers and other stakeholders, and/or in the fees charged.**
 - 0 Does not contribute to competitive advantage
 - 1 Does not contribute now but may improve competitive advantage in the future
 - 2 Contributes indirectly to competitive advantage
 - 3 Modestly contributes directly to competitive advantage
 - 4 Substantially contributes directly to competitive advantage
 - 5 Will produce a competitive advantage
- 4. Management Information – Extent to which it will produce better information for managing the core business**
 - 0 Unrelated to core business management information needs
 - 1 Will produce some information that will be useful to managers of core business processes

- 2 *Will produce some information useful in managing some activities in a core business process*
 - 3 *Provides essential information for managing at least one activity in a core business process*
 - 4 *Provides essential information for managing more than one activity of a core business process*
 - 5 *Provides essential information for managing activities in more than one core business process*
- 5. Competitive Response – Degree to which failure to do the project will cause competitive damage to the organization**
- 0 *Can be postponed for 12 months or more without negative effect*
 - 1 *Can be postponed for at least 12 months without negative effect but the cost of project may increase*
 - 2 *Postponement for up to 12 months will incur mild competitive damage*
 - 3 *Postponement for up to 12 months will incur significant competitive damage*
 - 4 *Postponement will risk potentially permanent loss of important business*
 - 5 *Postponement could risk the survival of the organization*
- 6. Strategic IS Architecture – Degree to which the information technology aspects of the proposal are aligned with the overall information systems strategies of the organization.**
- 0 *Significantly conflicts with the plan or direction*
 - 1 *Mildly conflicts with the plan or direction*
 - 2 *No effect on the plan or direction*
 - 3 *Is compatible with the plan or direction*
 - 4 *Supports the plan or direction*
 - 5 *Is an integral part of the plan or direction*

RISK

1. Organizational Risk – Extent of exposure to risks of concern to the organization and the degree to which such risks are managed. Positive risk management factors include effective management of change, project or project module is 18 months or less, amount of investment funds required is under 10% of overall IT budget.

- 0 Helps to mitigate existing risks
- 1 No increase in risks or exposure to risks
- 2 Would incur mild risk that should not be difficult to manage
- 3 Would incur increased risk in one or more areas that may be difficult to manage
- 4 Could incur a major risk that is of concern to the organization
- 5 Will incur a major risk that could seriously damage the performance or survival of the organization

2. Definitional Uncertainty – Degree the requirements (& specifications) are known, valid, reliable.

- 0 Requirements are firm, with high degree of certainty. Complexity is not a problem. Very predictable.
- 1 Requirements are moderately firm. Some complexity. Relatively good predictability.
- 2 Requirements are likely to change as the needs are better understood. Come complexity.
- 3 Requirements will need to change because they relate to a dynamic or complex area or environment.
- 4 Requirements are only partially known. They relate to a dynamic or complex area or environment.
- 5 Requirements are substantially unknown or are unclear. May involve much complexity or constant change.

3. Technical Uncertainty – Degree of technical risk, such as the technology management ability, technical skills needed software dependencies, hardware dependencies, and complexity of interfaces or integration.

- 0 There is no uncertainty regarding any technical factor
- 1 Requires no new skills, software, or hardware to perform the proposed effort
- 2 Requires some new skills, but no new software, or hardware to perform the proposed effort
- 3 Requires new skills or hardware; software is available commercially

- 4 Requires new skills, new hardware, substantial development of new software, or significant integration
- 5 Requires many new skills, unproven hardware, substantial development of new software, or major integration effort

4. IS Infrastructure Risk – Degree of non-project investment necessary (e.g., will new or additional support services be required?) and/or the extent it will burden the present infrastructure.

- 0 No investment required; no burden added.
- 1 Some minor infrastructure changes will be required, minimal investment is involved
- 2 Some changes in several areas will be required, modest investment is involved
- 3 Moderate changes will be required and it will use a significant part of the infrastructure support capacity
- 4 Changes affecting many areas will be required, significant investment and/or could seriously burden the present IS infrastructure and degrade the performance of other functions
- 5 Substantial IS infrastructure investment will be required or will seriously burden present infrastructure and performance.

The alternatives are then scored on an evaluation worksheet. The value categories are weighted based on the importance to the command. Then each alternative is scored based on the blank score sheet, shown below.

INVESTMENT ASSESSMENT WORKSHEET					
....Scores....					
VALUE	Evaluation Range	Weight	Alt1	Alt2	Alt3
1. ROI/Cost Reduction					
2. Strategic Match					
3. Competitive Match					
4. Management Information					
5. Competitive Response					
6. Strategic IS Architecture					
Value Score.....					

After scoring the alternatives for their value, each alternative is scored on risk.

Below is a blank risk score sheet.

RISK	EVALUATION RANGE	WEIGHT	ALT1	ALT2	ALT3
	(0-5)				
1. Organizational Risk					
2. Definitional Uncertainty					
3. Technical Uncertainty					
4. Infrastructure Risk					
Risk Score.....					

Migration Path#1 (Allowance)

Figure 4.5 shows the scoring for alternative one.

Value	Evaluation	Weight Range	Alt1
1. ROI/Cost Reduction	0-5	5	2
2. Strategic Match	0-5	5	3
3. Competitive Match	0-5	3	2
4. Management Information	0-5	5	4
5. Competitive Response	0-5	3	0
6. Strategic IS Architecture	0-5	5	3
Value Score.....			66

Figure 4.5 Alternative #1

Value Summary:

Giving officers an allowance meets the strategic match halfway. It does allow all officers to have a portable computer, but the Navy is increasing officer's salaries to get the computers. Once the computer is purchased, its value begins to

decrease after about three years. The allowance is provided over a three-year period to keep up with technology. The result is, the officer continues to purchase a new computer every three years and the old computer has no value.

Figure 4.6 displays the results of the risk evaluation for alternative #1

RISK	EVALUATION Range	Weight	Alt1
1. Organizational Risk	0-5	5	3
2. Definitional Uncertainty	0-5	5	2
3. Technical Uncertainty	0-5	4	1
4. Infrastructure Risk	0-5	4	2
Risk Score.....			37

Figure 4.6 Alternative #1

Risk Summary:

The major risk involved in giving officers an allowance for a computer is the responsibility placed on the officer. The officer is responsible for purchasing his/her own computer within Navy standards. In addition, some system must be in place to ensure officers are using their allowance to purchase the right computers. In addition, other personnel, both enlisted and civilian employees, may feel cheated and wonder why officers are getting a perceived pay raise.

Allowance Summary

Benefits

Officers would have an allowance to purchase a computer
Total costs for the allowance is less than buying desktops for all officers

Shortfalls

Difficult to monitor computer purchases
Buying a new computer every three years and no turn in value
Need method of repair/maintenance

Migration Path#2 (Desktops)

Figure 4.7 shows the value scores for alternative #2.

Value	Evaluation	Weight Range	Alt2
1. ROI/Cost Reduction	0-5	5	0
2. Strategic Match	0-5	5	4
3. Competitive Match	0-5	3	0
4. Management Information	0-5	5	4
5. Competitive Response	0-5	3	3
6. Strategic IS Architecture	0-5	5	1
Value Score.....			54

Figure 4.7 Alternative #2

Value Summary:

The goal is to provide 24-hour access to a computer for all officers. If the effort is strong to continue to ensure as many officers get computers as possible then it fits into the strategic plan. Is there a more economical method of ensuring officers have computers? Once the computer is purchased, the value decreases,

and after three years, the computer value declines. Figure 4.8 shows the risk scores.

RISK	EVALUATION Range	Weight	Alt2
1. Organizational Risk	0-5	5	1
2. Definitional Uncertainty	0-5	5	1
3. Technical Uncertainty	0-5	4	1
4. Infrastructure Risk	0-5	4	0
Risk Score.....			14

Figure 4.8 Alternative #2

Risk Summary:

The risks are low for continuing what the Navy is already doing. Commands would just continue to purchase computers for officers, within the command's budget. By not changing the business process of purchasing command computers, few risks are incurred. The infrastructure is already in place. The problem is that possibly all officers would not get a computer and possibly not have 24-hr access to a computer.

Desktop Summary

Benefits

Not changing the way we do business

Shortfalls

Not cost effective

All officers may not have a computer

Reduced Access – not portable

Migration Path#3 (Lease)

Figure 4.9 shows the value scores for alternative #3.

Value	Evaluation Range	Weight	Alt3
1. ROI/Cost Reduction	0-5	5	4
2. Strategic Match	0-5	5	5
3. Competitive Match	0-5	3	2
4. Management Information	0-5	5	5
5. Competitive Response	0-5	3	0
6. Strategic IS Architecture	0-5	5	4
Value Score.....			96

Figure 4.9 Alternative #3

Value Summary:

The lease idea scores high in matching the strategic plan of the Navy. The Navy wants to use technology to the greatest extent possible. Visions of future wars consist of smart management of information. While using technology, the other goal of the Navy is to stick to the budget. The lease agreement allows the Navy to issue computers for less money than to takes to purchase the computers.

Figure 4.10 shows the risk scores for alternative #3.

RISK	EVALUATION Range	Weight	Alt3
1. Organizational Risk	0-5	5	2
2. Definitional Uncertainty	0-5	5	1
3. Technical Uncertainty	0-5	4	2
4. Infrastructure Risk	0-5	4	2

Risk Summary:

There are not many risks with the lease. A system, to manage the lease and issue the computers to a large number of officers, will have to be in place. The method for issuing the leased computers does not have to be too extensive.

Once implemented, cost and benefits must be evaluated.

LEASE AGREEMENT SUMMARY

Benefits

All officers get a computer

Maintenance is in the contract and provided by the company

Inventory is included in the agreement

Upgrades are available from the company

The computers could be returned at any time

Shortfalls

Do not own the computers

Some command must manage the contract for a large number of officers

IT INVESTMENT ASSESSMENT WORKSHEET

VALUEScores....		
	Alt1	Alt2	Alt3
1. ROI/COST REDUCTION	10	0	20
2. STRATEGIC MATCH	15	20	25
3. COMPETITIVE MATCH	6	0	6
4. MANAGEMENT INFORMATION	20	20	25
5. COMPETITIVE RESPONSE	0	9	0
6. STRATEGIC IS ARCHITECTURE	15	5	20
VALUE SCORE.....	66	54	96

Figure 4.11 Comparison of value scores

As shown in figure 4.11, alternative #3 has the highest value score.

RISK	ALT1	ALT2	ALT3
1. Organizational Risk	15	5	10
2. Definitional Uncertainty	10	5	5
3. Technical Uncertainty	4	4	8
4. Infrastructure Risk	8	0	8
Risk Score.....	37	14	31

Figure 4.12 Comparison of risk scores

Figure 4.12 shows that alternative #2 has the lowest risk score. At this point, intangible benefits can also be evaluated to determine if the investment is economical.

If the value of the IT investment is compared to the risk, the lease alternative is the best choice, as shown in figure 4.13. The risk score is subtracted from the value score.

Overall Results:

	Migration Path #1	Migration Path #2	Migration Path #3
Value-Risk	29	40	65

Figure 4.13 Overall Score

G. IMPLEMENTING THE MIGRATION PLAN

Step 7 of TAFIM is the implementation plan for the selected migration path. The results of the IT Assessment Worksheet showed that leasing the computers would have the most value and the least risk. The first step in the implementation phase would be to determine who is going to be in charge of the new program. The thesis proposes that Naval Information Systems Management Center (NISMIC) be responsible for leasing the computers and issuing them to all Naval officers. Duty stations for Naval officers could be broken down into regions, and NISMIC could designate a central command within the region to be responsible for receiving computers and issuing them to officers. It would be ideal to have the company that is awarded the contract, located in each of the regions.

Implementation Steps

- Select responsible command for new program
- Publish instructions and guidance
- Negotiate contract for 56,000 laptop computers
- Company sends laptops to designated commands
- Designated commands assign serial numbers and issue computers to officers in their region.
- Officers use laptops
- Officers receive/turn-in computers to designated command and receives upgraded computer
- Evaluate costs and benefits of issuing computers

H. MAINTAINING THE MIGRATION PLAN

With frequent advances in technology, decreasing budgets, and decrease force strength, it is necessary to re-evaluate the migration plan to see if it can be improved. Every one to three years the lease alternative should be evaluated. A survey could be conducted among officers to ensure that the upgrade and maintenance service is acceptable. Also, the survey results could show any problems that the officers are having with leasing the computers. A frequent analysis of the benefits verses the costs should be conducted to ensure that this

is the most cost effective method of acquiring a large amount of computers. The benefits of issuing officers computers must be analyzed. Another survey could be conducted to determine how much the laptop computer is used.

To summarize Chapter IV, this thesis used the TAFIM model to strategically plan the implementation of issuing portable computers to all officers. In step 5, three migration paths were described and in step 6, the three paths were evaluated. The alternatives were evaluated using an IT Assessment Worksheet, where each alternative is scored based on value and risk. The result of the assessment is that migration path #3, the lease option, is the best choice. When the value of the alternative was compared to the risk of implementing the IT investment, the lease option scored the best.

V. CONCLUSION

A. SUMMARY OF THESIS IDEA

Admiral Archie Clemins, CINCPACFLT, has stated that all Naval officers onboard ships should have a computers on their desktops. He also stated that there should one computer for every five enlisted sailors. This thesis took that concept a step further, All Naval officers should be issued a laptop computer. The idea is to ensure that all officers have 24-hour access to a computer. The Navy would acquire a computer for every officer via a lease agreement and then issue it to them. The officer would have the freedom and flexibility to work at home or the office, at sea or in the field. The computer would be portable, so the officer could take the computer on travel or take it with him/her to other commands.

Today, when an officer reports to a new command, there is usually a desktop computer available for the officer's use. The computer may be a brand new computer with all the new technological features, or the computer may be outdated. The officer has to either bring all his/her old files with him/her to copy onto the desktop computer or recreate the old files. The thesis idea is that the officer will bring his/her issued computer to the new command. The officer should be able to just plug into the existing standardized framework and get to work. The officer, with an issued computer, would not have to adjust to a new system. The officer could immediately log into the Internet to check messages

and Navy news. Naval officers would always have the latest technology available in a laptop and have the necessary tools to be an Information Warrior.

This thesis proposed that all Naval officers need to have access to a computer. One of the benefits of having a laptop computer is for general communication. Officers could EMAIL various commands from any location in the world. The laptop allows for portable communication. One of the most important points of this thesis is that the officer with a laptop computer will have the flexibility to use the computer wherever he/she goes.

Naval officers could access databases and online publications. As technology advances, increasing the capability and ease of use of the Internet and online information, the officer could access information 24-hours a day. The officer has the ability to have up-to-date information on Navy news and Navy events. He/She could be a more informed officer and pass accurate information to junior personnel. As more and more information is moved into databases and websites, the officer could easily log into various databases for personnel information, forms, or instructions. Instead of obtaining hard copy instructions and print copies, the officer could log into a database and query it for the desired specific information to download.

The Navy has published standards for future computer and computer systems purchases. The laptops issued to officers would have these prescribed features. Since all Navy computers will eventually have the similar features and be running the same software, interoperability improves - officers can talk to anyone anywhere via the computer. A laptop computer could help to make the officer

more informed. All officers could be ultimate Information Warriors. Another benefit is the possibility of conducting computer-based training. Training could be conducted anywhere via the computer.

B. THESIS QUESTIONS READDRESSED

Do all officers really need a computer? The answer is yes! So much information is available online on the information superhighway. The officer must have the ability to access this information and be a more informed officer. All officers, it does not matter what their grade or job is, need a computer especially for general communications. As information is moved from printed form to databases or made available on the Internet, officers should have the capability of getting information from all sources.

Do all officers need the same type of computer and should there be software restrictions? The Navy has already published standards for purchasing new computer equipment and systems. The laptops leased for officers will be within these standards and all officers will use the prescribed software. The computers do not have to look exactly the same, they just need to be running compatible software.

What is the best method to acquire the computers (lease or buy)? Currently, the Navy is working to ensure that every officer onboard ship has a computer that has the features and software that the Navy has prescribed. Individual commands are responsible for determining if an officer needs a computer, and if they do, the command is responsible for providing a computer for that officer. The command has to be concerned about it's IT budget and

depending on the budget, whether or not it can afford to buy a computer for everyone.

The civilian workforce has leased computers and computer systems for some time now, and the Navy is now realizing the savings in leasing. CINCLANTFLT has released a contract request to lease computers and computer equipment. Bids are due in October 1997. The results of this thesis recommend that the Navy lease laptop computers for all officers.

The Navy is already buying desktop computers for most officers, which is a significant capital investment. With a lease agreement that capital investment is spread over a three-year period. At the end of the lease agreement, the computers are either returned at no cost to the government or the lease is renewed. The lease agreement cost would include maintenance and upgrades. The results of a USSOCOM life cycle study found that at the end of the third year life of a new computer, the value of the investment in that computer, declines. Normally, a computer is purchased with a three-year warranty. Maintenance is covered until the warranty expires, then the command is responsible for maintenance costs.

Commands need the personnel to maintain the computers. When the command determines that the computer is outdated and of no value, the computer is turned in with no return value. With a lease agreement, the computers can be returned at anytime at no cost to the government. In addition, the government can add and build onto that leased computer. When just the **cost** of leasing a computer is compared to the cost of buying a computer, it does

not appear to be significant. The intangible benefits must be measured to realize the value of leasing. With leasing, the most significant benefit is the fact that maintenance is covered by the company in the lease agreement.

How much would it cost to lease computers for all officers and are there any discounts for bulk quantities? Currently, USSOCOM is leasing desktop computers for \$109.00 a month per computer. Using \$109 per month the cost to lease computers for all Naval officers is: \$220 million over a three-year period. Companies consider the total quantity requested when submitting bids for the contract. There would not be a need to order more just to make a larger quantity. Companies do, however, offer that same price if at some point in the lease agreement, additional quantities are needed. The company usually agrees to keep the same price if more computers are needed. The lease agreement would include maintenance and upgrades.

How would implementation work and who would manage the program?

A contract request would be sent out by one Naval activity and the contract request would be for 56,000 officers or less, depending on force strength. This thesis recommends that NISMC be the program manager and provide contract specifics. The computers would then be issued to the officer with a signed custody form. There would be a “point-of-drop-off” designated close to the officers’ command. The officer would be responsible for the computer and allow only normal wear and tear.

What happens if the computer is lost or damaged? If the computer is lost, stolen, or damaged beyond repair, the computer will be surveyed by Navy

procedures, or returned to the company in accordance with the lease agreement. When upgrades become available, the officer will exchange the computer for the upgraded model. The computer transfers with the officer. Individual commands will no longer be responsible for purchasing and maintaining officers computers.

C. FUTURE WORK

The investment assessment worksheet used to evaluate the three alternatives is a valuable tool in evaluating investment ideas, but it can be biased toward the evaluator. The investment worksheet should be completed by more individuals and then compared. This will allow the analysis to be more subjective and a combination of various opinions.

There have already been lease requests for laptops submitted by CINCLANTFLT. Once the contract is signed, the cost and benefits could be evaluated with actual figures. The Navy can analyze the cost of leasing and the level of customer service.

This thesis recommends that the Navy conduct a formal study to determine the exact cost for a three-year phased implementation of lease and issue portable computers to every officer.

If we imagine the warriors of the next millenium, we usually picture them with a portable computer. Our "network-centric" warriors each need access to the global information network, and that requires a computer. It is time we issue each officer a portable computer.

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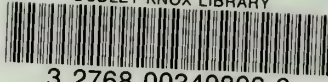
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